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per cent. $C+$, 11 per cent. $C-$, 4 per cent. $D+$, 2.5 per cent. $D-$ and 2.5 per cent. failure; or using only the four large steps, 14 per cent. should receive A , 44 per cent. B , 33 per cent. C , 6.5 per cent. D and 2.5 per cent. failure.

Fig. 3 shows how closely the actual distribution of the grades of upper classmen coincides with the theoretical distribution here computed. The continuous line is the theoretical distribution and the broken line is the actual distribution of 5,404 grades assigned to upper classmen in the college of letters and science in the University of Wisconsin. The latter are taken by permission from the unpublished report of Dean Birge.

The adoption of a uniform scale of grades as well as a uniform standard in the frequency with which the different grades are assigned is a pressing need among colleges and secondary schools. These ends could be attained by adopting the scale of eight passing grades, or the coarser one, for reasons given in the earlier part of this paper, and by having each teacher and each institution compare the frequency of the various grades assigned with the theoretical frequency. Then an $A+$ or a $B-$ would have more nearly the same significance under different teachers and in different institutions than they have at the present time.

DANIEL STARCH

UNIVERSITY OF WISCONSIN

THE AMERICAN CHEMICAL SOCIETY

ROCHESTER MEETING

THE forty-eighth annual meeting of the American Chemical Society was held at Rochester, New York, September 8 to 12. This is the first meeting held in September under the newly adopted constitution, and the large number present and the enthusiasm of the meeting amply justify the change in date from the Christmas holidays to the fall of the year.

Below will be found titles of the papers given at the meeting, with such abstracts as could be obtained. A study of the list shows a number of valuable contributions in both theoretical and applied chemistry. Most of these papers will be published in full in the journals of the society.

A complimentary dinner was given by the

Rochester Section to the council on the evening of September 8, and following this dinner was held the annual council meeting of the society. Charles L. Parsons was elected secretary of the society, and Dr. A. P. Hallock, treasurer, for a period of three years, under the revised constitution. W. A. Noyes was elected editor of the *Journal of the American Chemical Society*, and the board of associate editors was continued, with the exception of H. P. Talbot and A. A. Noyes, who asked to be relieved of this duty. W. Lash Miller, of the University of Toronto, was elected to the board with special reference to physical chemistry. M. C. Whitaker was elected editor of the *Journal of Industrial and Engineering Chemistry*, and the board of associate editors was continued and the editorial staff strengthened by the addition of two assistant editors. A. M. Patterson was reelected editor of *Chemical Abstracts*, and J. J. Miller and E. J. Crane associate editors.

The first general session was held in the assembly hall of the Eastman Kodak Company, Kodak Park, on Tuesday morning, and was opened by a cordial address of welcome by Mayor Edgerton, and replied to by President Little. Papers were presented as indicated below.

At the conclusion of the morning session the members and their guests were entertained at luncheon by the Eastman Kodak Company. After luncheon the manufacturing department of the Kodak Company was inspected by the members present, who were divided into groups of fourteen for the purpose and placed under the guidance of members of the Eastman Company's technical staff. This opportunity to see one of the most highly developed chemical industries in America was thoroughly appreciated. On Tuesday evening, the members were entertained by the Rochester Section at a smoker, the program for which had been prepared under the able direction of M. H. Eisenhart, assisted by other members of the local section, who provided an extensive program and elaborate feast for the occasion. Each guest was decked out in a commodious white apron, on which was inscribed in bold letters his name and address, and also wore a yellow Chinese mandarin cap with pigtail. The hall was decorated with flags, and contained many small balloons filled with hydrogen, which, as their buoyancy diminished, afforded special opportunities for amusement of the guests. Unusually attractive songbooks had been printed in the works of the Kodak Company, bearing the pin of the society in colors. Three other attractive souvenirs were distributed to each guest.

The smoker program was arranged with great care and consisted of solos by both local and professional talent, interspersed with music from an orchestra, songs from a membership quartette, interesting and instructive moving pictures, and several impromptu parades by guests. The entire function was most thoroughly organized and executed and will stand as a monument to the skill of the Rochester Section. On Wednesday night, President Little's address was given in the East High School, which was thrown open to the public. The President's address was a most authentic and comprehensive treatment of the subject of research in America, and its statements of the extent and thoroughness of this development in our more progressive industries will be an enlightenment to all who read it. The address is printed in the October number of the *Journal of Industrial and Engineering Chemistry*, and a careful reading will undoubtedly suggest to delinquent American manufacturers that serious and genuine industrial research will offer the only means to overcome foreign competition and antiquated methods and products.

The annual banquet was held on Thursday night at the Powers Hotel. Dr. L. H. Baekeland acted as toastmaster, and the principal speakers were President Rees, of the University of Rochester, Edward W. Morley, honorary president of the eighth International Congress, President A. D. Little, C. H. Herty, of the University of North Carolina, H. E. Howe, of Bausch and Lomb Optical Company, S. L. Bigelow, of Ann Arbor, and Secretary C. L. Parsons. A delightful feature of the banquet was the orchestra music and a number of soprano solos. With the menu was distributed to each member present an engraving entitled "The Alchemist," which will long be a reminder of the Rochester meeting.

The excursions to the plants of the Bausch and Lomb Optical Company, Taylor Instrument Company, Curtice Brothers Company, J. Hungerford Smith Company, Moerlbach Brewery, German-American Button Company, Genesee Reduction Company, Municipal Incinerator, Stecker Lithographic Company, and others, under the general direction of Mr. J. E. Woodland, chairman of the factory excursions committee, proved to be one of the most important features of the annual meeting. Rochester, being an industrial center, is admirably situated to provide this interesting and instructive feature of the program.

The Entertainment Committee had also made ample provision for the entertainment of the lady

members and visitors in the form of a reception at the University Club, a card party at the Century Club, an excursion to Irondequoit Bay with luncheon at the Newport House, and numerous automobile excursions through the city and neighborhood of Rochester.

The success of the meeting is due to the work of the local committees and it was the unanimous opinion of the visiting members that to the Rochester Section belongs the credit of organizing and administering to the minutest detail the innumerable features which contributed to the complete success of the forty-eighth annual meeting.

The papers presented follow.

GENERAL PROGRAM

General meeting of all divisions and sections was held in Assembly Hall, Kodak Park.

The following papers were presented:

JAMES OTIS HANDY: *Copper-covered or Copper-clad Steel. The Manufacture, Properties and Uses of Composite Metal made by Alloying or Welding Copper and Steel.*

Copper is known to resist atmospheric corrosion better than zinc, tin or tin and lead alloyed. Notwithstanding this, copper has been very little used as a protective coating for iron or steel. Processes have been recently perfected for making copper-clad steel. In one process the copper is alloyed to the steel and in the other it is welded. The advantages of the welded process are: great uniformity, high conductivity and a perfect union without loss of the characteristic properties of electrolytic copper or of high-grade soft steel.

Microphotographs show clearly the difference between an alloy union of copper and iron and a weld. The line of contrast in the latter case is very sharply defined, while in the former there is a gradation or shading of one metal into the other.

Alloys of copper and iron have lower conductivity than either copper or iron, therefore welded copper and iron which contains no alloy is superior for electrical purposes and for other uses as well because of its uniformity.

The use of this material for roofing, for culverts and other sheet-metal products is sure to greatly increase.

When exposed in the Pittsburgh atmosphere a sheet of copper .04 inch thick lost less than .1 per cent. in 21 months and a copper-clad steel sheet .06 inch thick lost less than .05 per cent. There was no excessive rusting of steel at the sheared edges of the copper-clad sheet.

Potassium cyanide solution is a solvent for copper and was used as such and as an etching medium in the study of copper-clad steels.

C. E. KENNETH MEES, D.Sc.: *The Physical Chemistry of Photographic Development.*

Photographic development depends on the fact that certain reducing agents can reduce grains of emulsified silver bromide which have been exposed to light, but not grains which have not been exposed to light.

The function of exposure is to produce a nucleus which enables silver to be precipitated with a lower reduction potential of the developer than would be necessary if no nucleus were present.

The energy required to produce this nucleus is so small that only one or two molecules per grain can be affected by the exposure.

The velocity of development follows the common type of equation for a monomolecular reaction, derived from the surface as the variable; it is conditioned chiefly by diffusion processes.

BERNARD C. HESSE: *The Patent Expert and the Chemical Manufacturer.*

Comparison of the general practise of American chemical manufacturers, in regard to patentable inventions, with European practise, shows that the latter provides for more care in examination of the prior art, in the preparation and prosecution of the specification and in the protection of rights under a granted patent than does the former.

The manifold advantages of having a patent expert, better called a patent chemist, primarily charged with the responsibility of attending to the above important details as well as in acting as a connecting link between the principal, the inventor, the counsel and the patent office are particularly emphasized and their advantages illustrated by reference to some actual cases; further duties, such as systematic watch over progress in the art, in general, as well as in the particular field of the principal and for his benefit, are also pointed out. The patent chemist may or may not be an integral part of the working staff, but he should be called upon at every new manufacturing or other step on the part of the principal.

HENRY LEFFMAN: *In Commemoration of the Centennial of the Publication of the Berzelian System of Symbols.* Will be published in *Jour. Amer. Chem. Soc.*

GEORGE A. SOPER: *The Utilization of Sewage.*

The authorities charged with the making of

plans for the disposal of sewage are frequently met by a public demand that the sewage shall be used as fertilizer. The belief that a large manurial value can be recovered is based upon the former belief of scientists and has been kept alive by novelists and other misguided persons. The fact is that the manurial value of sewage has been greatly overestimated. Sewage contains useful fertilizing ingredients, but experience shows that, like the gold in sea water, it costs more to extract them than they are worth.

Sewage works which are capable of utilizing the manurial ingredients are of two classes: First, those in which the sewage is applied directly to land, as in agriculture, and, second, those in which the utilizable ingredients are extracted by mechanical means, such as screening and sedimentation. Neither process has thus far proved profitable.

In the sanitary disposal of sewage, the management of the settleable impurities termed sludge is considered to be the point of central difficulty. In order to extract the manurial ingredients in sewage, it will be necessary to devise some method for the production of denser sludge than is now obtainable and a satisfactory process for the further concentration of the solid matters in the sludge should be looked for.

All recent contributions of science to the art of sewage disposal have been directed almost exclusively to the disposal of the wastes without offense and as little expense as possible, the idea being to get rid of the sewage and not to attempt to make use of its manurial value.

DIVISION OF AGRICULTURAL AND FOOD CHEMISTRY

H. E. Barnard, *Chairman*

Glen F. Mason, *Secretary*

H. E. BARNARD: *Laboratory Control of the Food Industry.*

The chemist is the technical adviser of the food manufacturer, both on practical questions that come up in the course of daily operations and on all points having to do with food laws. The canner and packer are just realizing that their industry is a technical, not a rule-of-thumb business and are establishing central laboratories in which much of the construction work in industry is being done.

F. C. COOK: *Bouillon Cubes.*

Ten samples of cubes collected on the New York market in the summer of 1912 were analyzed, with the following results:

The water averaged 5 per cent., the fat 1-4.5 per cent., the ash 50-74 per cent., which is practically all sodium chloride. The nitrogen bodies and undetermined material amount to 20-40 per cent. The P_2O_5 varied from .4 to 1.8 per cent., the nitrogen from 2.1 to 3.6 per cent., and the total creatinin from .49 to 1.67 per cent. The cubes consist of two thirds salt, the rest being meat extract and plant extract. A cube prepared largely from meat extract with little plant extract gives high P_2O_5 , total nitrogen and total creatinin figures.

Bouillon cubes are extensively advertised and are sold on account of their flavoring and stimulating properties, rather than for any slight food value they may possess. The large per cent. of sodium chloride which need not exceed 65 per cent. is used to furnish body to the cube and to give a salty taste to the cup of water in which the cube is dissolved.

Bouillon is a clear broth, the basis of which is meat, consequently a true bouillon cube should show high creatinin and total nitrogen figures and should be prepared entirely or largely from meat stock in addition to the fat and salt present. Several of the cubes on the market contain much more plant than meat extract, and are not entitled to the name "bouillon" unless modified.

H. E. HOWE: *A Refractometer for Sugar Determinations.*

EDWARD GUDEMAN: *Hydrolyses of Starch.*

W. E. RUTH: *Chemical Studies on the Lime-Sulphur-Lead-Arsenate Spray Mixture.*

The color changes resulting from mixing lime sulphur and lead arsenate are closely analogous to the color changes involved in the precipitation of lead thioarsenate.

Analyses of the resulting mixture showed that free sulphur was precipitated. The results led the writer to look for the presence of oxygen compounds of sulphur in the mixture and thio-sulphate was found to be present. There was some evidence for supposing that a thioarsenate was also formed in a small quantity.

The analyses of lime sulphur showed an increase in the quantity of thiosulphate and sulfites resulting from the mixing with lead arsenate, which probably explains the claim that mixing with lead arsenate increases the fungicidal value of lime sulphur.

O. G. MARCKWORTH: *The Commercial Utilization of Glucose and Glycerine in Modern Breads.*

PAUL POETSCHKE: *Sulphur Dioxide in Gelatine.*

An investigation of the quantitative determination of sulphur dioxide in gelatine, giving an account of the sources of error to be avoided, together with a detailed description of a method designed to eliminate the errors described and to secure uniformity of analytical results.

Sulphur dioxide is found in gelatine, even if prepared from selected stock and without its direct addition, as shown by analyses of such preparations made in the laboratory. Absorption of sulphur dioxide takes place from the air during the drying of the gelatine.

A summary of 1,060 analyses of commercial gelatine and 36 analyses of stock used in gelatine manufacture is given.

LUCIUS L. VAN SLYKE and ORRIN B. WINTER: *Solubility of Casein in Dilute Acids.*

Casein, freshly prepared by precipitating skim-milk with acetic acid and washing free from acid, was treated with 100 c.c. of different acids of known strength for given periods of time at definite temperatures and the undissolved residue determined. The acids used were hydrochloric, sulphuric, lactic and acetic; strength of solutions, N/10, N/100, N/500; time of contact, 1, 5 and 15 minutes; temperatures, 15°, 25° and 42°. In general, the amount of dissolved casein increases with increase of temperature, time of contact, and concentration of acid. Hydrochloric acid dissolves most, and then come in order lactic, sulphuric and acetic.

J. A. LEClerc and L. H. BAILEY: *The Effect of Rain on the Value of Hay.*

Experiments were conducted with seven kinds of hay. One thousand grams of each kind was divided into two equal portions, A and B. Portion A was dried, weighed, ground and analyzed. Portion B was similarly dried, then leached with water for 5 minutes, and then again dried, weighed, ground and analyzed. The results, based on one ton of freshly-cut hay, show a considerable loss in dry matter, protein, sugars, ash, phosphoric acid, potash and a somewhat lesser loss of fat (ether extract), pentosans, lime and magnesia.

P. B. DUNBAR and W. D. BIGELOW: *The Acid Content of Fruits.*

The characteristic acids of a large number of the common fruits have been identified and determined.

The acidity of plums, apples and cherries appears to be due entirely to malic acid which is

probably present, for the most part, in the free state. Currants always contain citric acid, and may or may not contain malic acid. Gooseberries contain large amounts of both malic and citric acids. In persimmons and bananas, malic acid probably occurs alone. The pomegranate and cantaloupe contain citric acid, probably without malic acid. In the watermelon, quince and peach, malic acid predominates, and citric acid is probably absent. Cranberries contain both malic and citric acid. Red raspberries contain citric acid, with malic acid present in traces, if at all. Blackberries contain citric acid in some cases, while some samples contain traces of malic acid without citric and in others neither malic or citric acids could be identified. The acid of the apricot has not been positively identified. There is present some dextrorotatory acid whose rotation is increased by the addition of uranyl acetate—possibly tartaric or dextromalic acid. The acid of the huckleberry has not been positively identified. Traces of malic acid without citric appear to be present. Tartaric acid was not found in any of the fruits examined, with the possible exception of apricots. In the case of pears, Kieffer, Le Conte, Idaho and Bartlett contain little or no malic, while citric acid appears to predominate. In all other varieties the acidity appears to be due mostly or entirely to malic acid.

The paper also includes a review of the literature on the acidity of fruits, with the results of various writers presented in tabular form.

J. A. BIZZELL and T. L. LYON: *Estimation of the Lime Requirement of Soils.*

The authors propose a modification of the method described by R. Albert¹ for estimating the lime requirement of soils. The modified method is as follows:

Place 25 grams of the air-dried soil in a Jena kjeldahl flask. Cover with 50 c.c. boiled distilled water and add 50 c.c. tenth normal barium hydroxide solution. Digest in a briskly boiling water bath for one hour with occasional shaking. Remove from the water bath, add 150 c.c. distilled water and 5 grams solid ammonium chloride. Connect the flask with a nitrogen distillation apparatus and distill. Collect the distillate (150 c.c.) in tenth normal acid, and titrate, using methyl-orange as indicator. The strength of the barium hydroxide is determined by titrating directly 50 c.c. of the solution, using methyl-orange as indicator. The difference between the two titrations, there-

fore, represents the amount of barium hydroxide absorbed by the soil. A correction is made for the slight decomposition of ammonium chloride when heated with soil.

The results obtained on 22 samples of soil accord fairly well with those obtained by the Veitch lime-water method.

H. V. TARTAR: *The Valuation of the Lime-sulphur Spray as an Insecticide.*

L. M. TOLMAN and J. G. RILEY: *The Effects of Raw Materials on the Chemical Composition of American Beer.*

FLOYD W. ROBINSON: *Food Standards and their Effect upon Food Law Enforcement.*

J. F. SNELL and J. M. SCOTT: *The Analysis of Maple Products. II.: A Comparative Study of the Delicacy of Methods.*

The authors compare the range of variation of conductivity value, ash data and Winton, Ross and Canadian lead values in genuine maple syrup and the rates at which these data diminish as sucrose syrup is admixed.

Conductivity value shows narrowest range, Canadian lead value most rapid diminution. Winton value has much narrower range than Canadian and gives closer duplicates. In Canadian method wash water may be indifferently 80° or 100° C. and 100 or 150 c.c. Lead values on basis of fixed quantity dry matter by (1) calculation, (2) direct determination do not accord.

DIVISION OF ORGANIC CHEMISTRY

Treat B. Johnson, *Chairman*

William J. Hale, *Vice-chairman and Secretary*

E. KOHMANN and TREAT B. JOHNSON: *The Structure of Urushiol, a Component of Japanese Lac.*

S. F. ACREE: *The Reactions of Both the Ions and the Non-ionized Forms of Acids, Bases and Salts.*

WM. LLOYD EVANS and CHARLES R. PARKINSON: *The Existence of Mandelic Aldehyde in Aqueous Solution.*

Mandelic aldehyde acetal was prepared by the reduction of benzoylformaldehyde acetal, which in turn was made by the interaction of dibromacetophenone and sodium ethylate. Mandelic aldehyde acetal hydrolyzes in the presence of sulfuric acid, both at ordinary temperature and at 0°, the intermediate compound formed undergoing a rearrangement to benzoyl carbinol. This hydrolysis takes place also by means of the water vapor of the atmosphere. The same rearrangement was ob-

¹ *Zeit. f. Angewandte Chem.*, I, p. 533.

served by Nef, with lactic aldehyde acetate and mandelic aldehyde acetate at 100°. On the other hand, Wohl and Lange, and Kranz have shown that lactic aldehyde is capable of existence at ordinary temperature.

C. G. DERICK and O. KAMM: *The Mechanism of the Rearrangements of Dihydro-β-Napthoic Acids.*

CARL O. JOHNS and EMIL J. BAUMANN: *Researches on Purines xii.: 2-Oxy-6-Methyl-9-Ethylpurine; 2-Oxy-6, 8-Dimethyl-9-Ethylpurine; 2-Oxy-6-Methyl-8-Thio-9-Ethylpurine; 2-Methylmercapto-6-Oxy-8-Thiopurine; 2-Oxy-6-Methyl-9-Ethylpurine-8-Thioglycollic Acid.*

CARL O. JOHNS and EMIL J. BAUMANN: *Researches on Purines xiii.: 2, 8-Dioxy-1, 6-Dimethylpurine; 2, 6-Dioxy-3, 4-Dimethyl-5-Nitropyrimidine (α-Dimethyl-Nitrouacil).*

J. H. RANSOM and R. E. NELSON: *Acyl Derivatives of o-Aminophenol.*

The work covered by this report is a continuation of that of the senior author on the molecular rearrangement of the acyl derivatives of o-aminophenol.² The hydrochloride of the isoamyl carbonate was prepared and identified by its properties. On warming its solution it quickly changed to the corresponding urethane. Diacyl derivatives were prepared coupling the isoamyl carbonate both with the ethyl carbonate and with the benzoyl group, and introducing these groups in reverse order. Identical diacyl derivatives resulted in both cases, without the isolation of any intermediate products. Rearrangement proceeded in the direction to leave the carbonate radical attached to the nitrogen, its weight relative to the other acyl exerting no influence on its position. In the case of both acyls being carbonates (isoamyl and ethyl) the lighter of the two is attached to nitrogen.

W. M. BLANCHARD: *Diacetyl: A Study in Structural Chemistry.*

L. V. REDMAN, A. J. WEITH and F. P. BROCK: *The Determination of Phenol in the Presence of Formaldehyde and Hexamethylenetetramine.*

In the regular determination of phenols by bromine or iodine the presence of hexamethylenetetramine does not interfere. Formaldehyde does interfere with the determination. If a few c.c.'s of strong ammonia be added to the mixture of phenol and formaldehyde and the solution then acidified the formaldehyde is changed to hexamethylenetetramine and the determination of the phenol may be made accurately.

² *Am. Chem. Journ.*, Vol. XXIII., p. 1.

L. V. REDMAN, A. J. WEITH and F. P. BROCK: *Synthetic Resins Produced by the Anhydrous Reaction Between Phenols and Hexamethylene Tetramine.*

A historical review is given of the reaction which takes place in a water solution between phenol and active methylene groups.

A new reaction is presented, the anhydrous reaction between dry phenols and hexamethylenetetramine in which synthetic resins are formed and NH₃ eliminated as a by-product.

Resins of variable properties are produced, depending upon the proportions of phenol to hexa. Some resins with excess phenol are liquid at all temperatures above 30° C., others are solid at all temperatures to the point of charring.

The resins are solid or spongy, depending on the rate and degree of heating.

The last intermediate product formed before the resin becomes insoluble is endeka-saligeno-saligenin with a formula C₉H₈O₁₄.

L. V. REDMAN, A. J. WEITH and F. P. BROCK: *Varnishes and Lacquers Made from Synthetic Resins.*

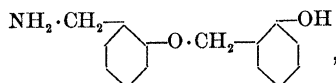
A comparison is made between synthetic resins made from phenol + formaldehyde with condensing agent and phenol + hexamethylenetetramine. The advantage of the latter process is uniformity of product. Both classes are soluble in caustic. The introduction of an inert group anisol, phenetol, etc., to block the free hydroxyl of the phenol, produces resins which satisfactorily resist the action of caustic alkalis and also show an improvement in lightness and permanency of color. The uses of varnishes and lacquers made from the resin are given.

L. V. REDMAN, A. J. WEITH and F. P. BROCK: *A New Synthetic Resin.*

This resin is formed by the anhydrous reaction between phenol, four parts, and hexamethylenetetramine, one part. Article gives description of reaction, uses, physical properties and a comparison with similar substances. Its properties, which depend upon the treatment given, are: Sp. gr. 1.2-1.3; fusibility 100° C. to infusible; hardness 2.5-4; solubility, soluble to insoluble; toughness, from that of glass to wood; tensile strength, 4,500 pounds per square inch; crushing strength, 32,000 pounds per square inch; dielectric strength, 80,000 volts per mm.; specific electrical resistance 28 × 10⁸ megohms per cm.³ This resin is easily moldable in almost endless variety.

L. V. REDMAN, A. J. WEITH and F. P. BROCK: *The Rate of Reaction Between Hexamethylene-tetramine and Phenol.*

The rate of reaction before the insoluble stage is reached is followed by measuring the ammonia evolved. Intermediate products are formed. Amino-saligeno-saligenin,



was isolated and identified.

The rate of transformation into the insoluble stage is followed by separating the resin into (1) alkali insoluble, (2) alkali soluble and acid insoluble, (3) alkali, acid and water soluble.

TREAT B. JOHNSON: *Chairman's Address. The Practical Utility of Hinsberg's Reaction.*

EDWIN F. HICKS: *An Anomalous Reaction of Resorcinol.*

F. B. ALLAN and C. R. RUBIDGE: *The Action of Phthalic Anhydride on Benzene in Presence of Aluminium Chloride.*

F. B. ALLAN and H. C. MARTIN: *o-Benzoyl-Benzoyl Chloride and o-Benzoyl-Benzoyl Cyanide.*

A. W. SCHORGER: *The Oleoresins of Jeffrey and Singleleaf Pines.*

The oleoresin of singleleaf pine (*P. monophylla*) contains 19.00 per cent. of volatile oil; 79.63 per cent. colophony; trash 0.11 per cent.; water 1.26 per cent. The volatile oil, d_{40}^{20} 0.8721–.8733, $n_{D_{20}}^{20} + 14.41^{\circ}$ to $+ 17.26^{\circ}$ contains 80–85 per cent. α -pinene; 4–5 per cent. *l*- or *i*-limonene, 4–6 per cent. *d*-cadinene; losses 4.5 per cent. The colophony contains 7.22 per cent. resene and resin acids isomeric with abietic acid.

The oleoresin of Jeffrey pine (*P. Jeffreyi*) has an average content of 9.96 per cent. volatile oil, 87.88 per cent. colophony, 1.69 per cent. water and 0.47 per cent. trash. The volatile oil, d_{40}^{20} .6951–.7110, contains about 95 per cent. *n*-heptane and 5 per cent. of an aldehyde apparently citronellal. The colophony contains 12.5 per cent. resene and resin acids isomeric with abietic acid.

A. W. SCHORGER: *The Leaf Oil of Douglas Fir.*

The oils distilled from the Douglas fir (*Pseudotsuga taxifolia*) in California had: d_{40}^{20} .8727–.8779; $n_{D_{20}}^{20}$ $- 17.02^{\circ}$ to $- 22.17^{\circ}$; ester No. after acetylation 27.50–51.78; they contained: 1- α -pinene 25 per cent.; 1- β -pinene 48 per cent.; *i*- or *l*-limonene 6 per cent.; fufurol; bornyl acetate 6.1 per cent.; free alcohol as borneol 6.5 per cent.; "green

oil" 3 per cent.; losses by polymerization, etc., 5 per cent.

WILLIAM J. HALE: *The Condensation of Thiourea with Acetylacetone.*

NELLIE WAKEMAN and EDWARD KREMERS: *The Water and Volatile Oil Content of the Leaves of Monarda fistulosa.*

Although the oil of *Monarda fistulosa* had been distilled frequently, no systematic study of the exact oil content of the plant has been made thus far. Inasmuch as the leaves contain by far the largest portion of the oil that is obtained when the flowering herb is distilled, these organs were separated from the stems and distilled in the fresh condition. In order that the percentage might be computed with reference to the dry material, moisture determinations were also made. Since the oil content of the dried leaves is not inappreciable, the moisture determinations were made by the xylene method. The series of experiments here referred to were made during the spring and summer of 1911. The early material was obtained from wild plants, the later material from the medicinal herb garden, a cooperative experiment between the Bureau of Plant Industry and the University of Wisconsin. From the tabulated data it became apparent that the oil content increased with the advance of the season whether computed for the fresh or dry herb.

E. N. DOANE and EDWARD KREMERS: *The Physical and Chemical Constants of a Number of Monarda fistulosa Oil.*

Comparatively early in the study of the *Monarda* oils efforts were made to ascertain the several changes in the oil as expressed by the physical constants and phenol content. In connection with the cultivation of the wild bergamot in the medicinal herb garden, a cooperative experiment between the Bureau of Plant Industry and the University of Wisconsin, at Madison, it seemed highly desirable to ascertain what changes might be noted in connection with the oils distilled each year. For this purpose the chemical constants of the dephenolated oil (acid number, saponification number, saponification number after acetylation) as well as the physical constants of the original and dephenolated oils were ascertained. The conclusion arrived at thus far is that the metabolic processes of the plant, so far as its volatile products are concerned, appear to be subject to but slight changes in different years.

CHARLES L. PARSONS

(To be continued.)